

REMARKS

Reconsideration of this application as amended is respectfully requested.

Submitted herewith for the examiner's consideration and approval is an amended drawing Figure 10 with the changes shown in red ink. Reference numeral 328 has been added to the drawing to overcome the objection to the drawings.

Claim 7 has been amended in such manner as to overcome the rejection under 35 USC § 112, 2nd paragraph.

Claims 60, 61 and 62 have been amended to change their claim dependency to claim 59, therefore overcoming the rejection under 35 USC § 112, 2nd paragraph.

Applicant's respectfully traverse the rejections of claim 1 over the cited prior art. Beginning at page 5, third full paragraph, claim 1 is stated as being rejected as being unpatentable over Jarrett in view of Kemnitz and in further view of Berchem et al and Reinberger. The rejection goes on, however, to discuss German reference 3,032,672 which forms no part of the rejection. The examiner does not state what basis there would be for combining the teachings of Berchem and Reinberger with those of Jarrett and Kemnitz in any manner to support a rejection of claim 1. As such, it is respectfully submitted that the examiner has failed to meet the burden of establishing a *prima facie* rejection of claim 1 as being unpatentable over Jarrett in view of Kemnitz and in further view of Berchem and Reinberger as identified on page 5, 3rd paragraph.

Applicant's further traverse the rejection of claim 1 as being unpatentable over German 3,032,671 (DE '671) in view of Baster, and in further view of Berchem and Reinberger as set forth beginning at page 10, second full paragraph of the action and continuing through page 11, paragraph 3 of the action. Claim 1 recites a method of forging a piston comprising die forging a blank of steel in a first axial direction longitudinally of the

piston to produce a one piece forged structure including at least a portion of a piston head, a pair of laterally spaced pin bosses extending downwardly from the head, and a piston skirt having a pair of laterally opposed skirt portions spaced from the pin bosses and struck portions extending between and joining the skirt portions to the pin bosses as a one piece structure. The method further includes die forging the blank in at least a second axially direction transverse to the first axial direction to produce a forged recess in each of the strut portions of the piston skirt.

It is respectfully submitted that the examiner has failed to establish a proper *prima facie* rejection of claim 1 over these four references. The examiner acknowledges that the three references of DE '671, Baster and Reinberger fail to teach forming a piston having an integrated piston skirt by the recited multi-axial forging operation called for in claim 1. There is no doubt that the forth reference to Berchem et al lacks any teachings of multi-axial forging a piston having skirt and strut portions associated with the pin bosses which includes the step of forging the piston in a direction transverse to the longitudinal direction to form recesses in the strut portions of the skirt. The sole basis of motivation relied upon by the examiner in combining the references to reject claim 1 is "a matter of design choice". However, before the PTO may combine the disclosures of two or more prior art references in order to establish *prima facie* obviousness, there must be some reason, suggestion, or motivation found in the prior web by a person of ordinary skill in the field of the invention at the time of applicant's invention would have made the combination. In re Jones, 21 USPQ 2d 1941 (Fed.Cir. 1982).

A showing of a suggestion, teaching, or motivation in the prior art teachings must be clear and particular. The best defense against the subtle but powerful attraction of hindsight-based obviousness is rigorous application of the requirement for the showing of the teaching or motivation to combine prior art references. In re Dembiczak, 50 USPQ 1614 (Fed.Cir. 1999).

The fact that a prior art device can be modified so as to produce the claimed invention is not a basis for an obviousness rejection unless the prior art suggests the desirability of such a modification. In re Gordon, 221 USPQ 1125 (Fed.Cir. 1984).

Moreover, the examiner's reasoning that multi-axially forging is "a matter of design choice" is an improper basis for combining the teachings of the references. See also In re Lee, 61 USPQ 2d 1430 (Fed.Cir. 2001) where the Federal Circuit reversed the board of patent appeals and interferences for improperly relying upon the "common knowledge and common sense" of a person of ordinary skill in the art to find an invention of a patent application obvious over a combination of two prior art references. The Federal Circuit emphasized that the factual question of motivation to select and combine reference is material to patentability, and can not be resolved on subjective belief and unknown authority. It is respectfully submitted that the present rejection of claim 1, at best, relies on hindsight and is improper and should be withdrawn.

In addition to the lack of motivation, it is unclear whether the references relied upon by the examiner would yield the claimed invention even if modified. While the examiner takes the position that DE '671 fails to show the details of the skirt, such is not the case as evidenced by drawing Figures 1-4. In each case, the walls of the skirt are shown at 1 and are straight up without any recesses or cavities calling for multi-axial forging. The piston of Baster is clearly one that is cast, as it would be impossible to form the numerous intricate cavities and recesses in forging operation. It is thus unclear how or why one skilled in the art would combine any features of Baster with those of DE '671, since they are completely different pistons. The piston of Reinberger is no different than that of DE '671, since the walls of the skirt are straight and lacking any reentrant recesses that would preclude forging in one axial direction (see Figure 4). All of the forging in the lateral direction in Berchem takes place

well spaced from the skirt, and it is not clear how one would apply any teaching of Berchem to those of the other three prior art references relied on by the examiner in any manner to arrive at applicant's claimed invention, short of hindsight reconstruction of applicant's claim 1.

It is respectfully requested, therefore, that the examiner reconsider and withdraw the rejection of claim 1 over DE '671 in view of Baster and in further view of Berchem and Reinberger.

Applicant's respectfully traverse the rejection of claim 35 as being anticipated by Amdall or Baster. Claim 35 recites a forged piston including a piston skirt forged as one piece with the pin bosses with a pair of opposed skirt portions spaced from the pin bosses and intervening strut portions extending between and uniting the skirt portions to the bosses, with the strut portions presenting outer surfaces facing in opposite directions along the pin bore axis and having lower edges. Claim 25 further recites forged recesses formed in the outer surfaces of the strut portions.

Column 2, lines 27-31 clearly disclose the Amdall piston as being a cast piston. There is no teaching of the piston being forged. The piston of Baster is also necessarily cast, since it would be impossible to have forged the geometry of the piston, including such features as the lined insulating space 28 and closed cooling gallery 37, which would be entirely inaccessible to forging. Accordingly, one skilled in the art considering the disclosure of Baster would not fairly be taught that the disclosed piston geometry could possibly be forged, since its geometry, with its reentrant internal and in some cases entirely blind passages could not be forged and must be cast. The examiner points to no teaching in either reference of the piston being forged, as called for by claim 35.

Applicants respectfully traverse the examiner's dismissal of the "forged" limitation of claim 35 as being merely a product-by- process limitation. The limitation

"forged" is a structural limitation well understood by those skilled in the art. The examiner improperly concludes that a metal article, whether cast or forged, ends up being structurally equivalent. Such a simplistic treatment of the processes ignores the different structural end results of articles that are forged as opposed to cast. It is well known that casting involves heating metal to a molten state and then pouring it into a mold where the molten metal solidifies and takes on the shape of the mold cavity. As the metal solidifies, grains form having a structure that are characteristic of casting. A forged article, on the other hand, is one that has been shaped plastically, such that the solid material flows plastically under the force of forging from an initial shape to the final shape. As a result of plastic material flow, the grains are elongated in the direction of material flow. The effect of the directional grain flow is to produce marked directional properties in the forged article, much like wood, such that the article has greater ductility and toughness in the direction of the elongated grains than in a direction across the direction of grain flow. By contrast, a cast article does not have such directional properties, but is isotropic. Submitted herewith as further evidence of the structural meaning of "forged" as opposed to simply an identification of a process, are select pages from the Metal Handbook Desk Edition published by the American Society for Metals, Copyright 1985, select pages from Modern Shop Practice, published by the Machine Precision Institute, 1941, select pages from An Introduction to Metallurgy, Second Edition published by Edward Arnold Publishers Limited, Copyright 1975. Also submitted for consideration by the examiner is a copy of a page from Webster's Third New International Dictionary, Copyright 1993 in which the term "forging" is identified as a noun and defined as "a piece of forged work (as in iron)".

Thus, contrary to the examiner's conclusion that the term "forged" in claim 35 is merely a product by process limitation, the term "forged" is understood in the art to have

certain implicit structural and mechanical characteristics different than that of cast articles. The examiner's attention is further invited to several of the references of record in which the terms "forged" and "cast" are used in connection with pistons in a structural, rather than product by process sense. Examples includes U.S. Patent No. 6,026,777 to Kemnitz describing and claiming a piston made of "forged" steel; U.S. Patent No. 5,150,517 to Martins Leites et al in which two parts of the piston are described as being formed separately from blanks of "forged" or "cast" steel which are machined, joined by welding, and further machined to the shape shown; U.S. Patent No. 4,910,093 to Berchem et al describing a "forged" piston blank for a "forged" piston; U.S. Patent No. 2,771,327 describing in column 2, lines 21-29 discussing the distinctions between "forged" and "cast" pistons, as well as numerous other references of record in which the term "forged" is used to characterize pistons or piston components, beyond simply identifying a process.

Accordingly, since neither Amdall nor Baster disclose a forged piston, particularly one having the recited forged recess formed in the outer surfaces of the strut portions, it is respectfully submitted that the rejection of claim 35 as being anticipated by either of these references is improper and should be withdrawn.

Applicant's further traverse the rejection of claim 35 as being obvious over Jarrett in view of Kemnitz. The examiner concedes that the piston disclosed in Jarrett lacks the recited skirt structure including the strut portions uniting the skirt portions to the pin bosses and including the recited forged recesses formed in the outer surfaces of the strut portions. As evident from Figures 1 and 3 of Kemnitz et al, the skirt and pin bosses of Kemnitz et al also lack the recited forged recesses in the strut portions of the skirt, as called for by claim 35. The examiner's remarks on page 5, line 10 that the "recess is relative to the outer surface of the skirt" in reference to Kemnitz does not clearly identify where in Kemnitz

such a recess is formed in the strut portions, as claimed.

Moreover, the examiner states, without support, that the skirts of Jarrett and Kemnitz are "functionally equivalent" and that they could be substituted as a matter of "engineering expediency". However, the fact that the references may be combinable is not sufficient motivation to sustain a *prima facie* rejection of obviousness. It is incumbent upon the examiner to point out with particularity the teachings or suggestions in the prior art that would lead one of ordinary skill in the art to make the change proposed by the examiner. The examiner's sole reliance on the skill of those in the art provides no evidence as to why one would be motivated to make the proposed change in order to arrive at applicant's invention of claim 35.

Since the skirt of Kemnitz and Jarrett are formed as one part with the remaining lower half piston portions, it is also not clear how one would go about adapting the lower half portion of Kemnitz to mate with the upper half portion of Jarrett without substantial untaught modification of the lower half piston structure of Kemnitz. It is conceivable that the modifications necessary to make the lower half of Kemnitz mate with the upper half piston portion of Jarrett would likely lead to the lower half piston structure already disclosed in Jarrett, particularly since Jarrett discloses a suitable lower half construction and there is no teaching or suggestion in either reference as to why one of ordinary skill in the art would replace the lower half piston of Jarrett with anything other than that shown. The examiner's conclusion that such would be merely obvious as a matter of engineering expediency, rather than pointing to particular teachings or suggestions in the art to make the change, is evidence that the rejection is based on impermissible hindsight reconstruction of claim 35, and not on the teachings of the prior art. It is respectfully submitted, therefore, that the rejection of claim 35 over Jarrett in view of Kemnitz is improper and should be withdrawn.

Applicants further traverse the rejection of claim 35 as being unpatentable over DE '671 in view of Baster. DE '671 shows a two part piston in which the lower part is made with an integrated skirt, and clearly the skirt lacks the recited strut portions formed with the forged recesses as called for by claim 35. U.S. Patent No. 3,104,922 to Baster is obviously a cast piston, since it is disclosed as being formed as one piece and it would be impossible to form the numerous blind and reentrant inner contours and passages by any forging operation relied upon by the examiner. If it is the examiner's position that the piston of Baster could be forged, it is respectfully submitted that the examiner identify a forging process capable of manufacturing the piston shown throughout the various views in a single piece. As such, it is respectfully submitted that the teachings with respect to the cast piston of Baster are generally inapplicable to applicants' claimed forged piston, since Baster provides no guidance whatsoever connected with a forged piston, and particularly the provision of forged recesses in the strut portions of an integrated skirt, and thus adds nothing to the teachings of DE '671. Accordingly, one of ordinary skill in the art would not look to Baster for any teaching or suggestion on how to modify DE '671 in any manner as to arrive at applicant's claim 35. The only reason given by the examiner for combining the references is that they are both in the field of pistons and that it would be a matter of "engineering expediency". Such reasoning is insufficient to establish a *prima facie* rejection of claim 35 and it is respectfully requested that the examiner reconsider and withdraw the rejection of claim 35 over DE '671 in view of Baster.

Independent claim 71 has been amended to include the limitations of claim 76, where the lower crown portion is multi-axially forged to include forged recesses in the piston skirt in one or more areas inaccessible by forging in the longitudinal direction of the piston. Applicant respectfully traverses the rejection of claim 76 (now incorporated into claim 71)

over Jarrett in view of Kemnitz et al for the same reasons given above in support of the allowability of claim 35 over this combination. The references are not properly combinable for the reasons stated above in connection with claim 35 and, even if combined, there is no teaching suggestion or motivation given in either of these references alone or in combination for providing forged recesses in the piston skirt that are inaccessible by forging the piston in the longitudinal direction, as called for by claim 76 (now claim 71). The examiner's dismissal of the limitations of former claim 76 as being "a matter of engineering expediency" is an insufficient basis for combining the references and does not clearly point to particular teachings in the prior art that would have motivated one of ordinary skill in the art at the time of applicant's invention to combine them in the manner suggested by the examiner. Even if combined, it is respectfully submitted that any resultant piston would not meet the limitations of amended claim 71, since there is no teaching or suggestion in either reference of forming forged recesses in the piston skirt that would be inaccessible by forging in the longitudinal direction of the piston as called for by former claim 76. It is respectfully submitted, therefore, that claim 71 distinguishes applicant's invention patentably over Jarrett in view of Kemnitz et al and should be allowed.

Applicant further traverses the rejection of amended claim 71 as being obvious over Amdall in view of Martins Leites. Amdall clearly calls for the piston to be cast entirely as one piece, or for the upper dome portion 18 to be cast separately from the lower skirt portion 20 and the two parts joined by brazing (column 2, lines 27-31). There is no teaching or suggestion in either Amdall or Martins Leites, alone or in combination, of providing a forged recess in the skirt of either reference which would be inaccessible by forging the skirt in the longitudinal direction of the piston, as called for by former claim 76. In the remarks, the examiner gives no reason whatsoever for the rejection of former claim 76, apart from a general

discussion about what each of the references discloses and the conclusion that to combine them would be a matter of "engineering expediency" on grounds that they are both in the same field. The limitations of former claim 76 (now in claim 71) are nowhere discussed in the examiner's remarks. It is respectfully submitted, therefore, that amended claim 71 distinguishes applicant's invention patentably over the prior art of record and should be allowed.

Applicants further traverse the rejection of former claim 76 given on page 12, beginning at the fifth line of the third paragraph over DE '671 in view of Baster and in further view of Martins Leites. As argued above with respect to claim 35, DE '671 fails to disclose or suggest the formation of a forged recess, and particular one which is inaccessible by forging the piston in the longitudinal direction, as called for by amended claim 71, and the secondary Baster reference is limited in its teachings to cast pistons. Martins Leites likewise fails to teach or suggest the recited recess. The examiner's sole reasoning for combining the references on grounds that they are in the same field and that it would be a matter of "engineering expediency" is insufficient to sustain a *prima facie* rejection, as the examiner is required to point out with particularity what teachings or suggestions exist in the prior art for motivating one of ordinary skill in the art to make the combination called for by the examiner. Moreover, even if the references were combined, a piston having the features called for in amended claim 71 would not be present, and thus claim 71, is further believed to distinguish applicant's invention patentably over DE '671 in view of Baster and in further view of Martins Leites and should be allowed.

Independent claim 77 has been amended to characterize the lower crown portion as being multi-axially forged and including a forged tranverse recess in the lower crown portion inaccessible by forging in a longitudinal direction of the lower crown portion.

DE '671 fails to disclose a piston having such structure. The secondary of Martins Leites shows a two part piston, but there is no teaching as to including the recited forged recess in the lower crown part which is inaccessible to forging the lower crown part in the longitudinal direction. It is respectfully submitted, therefore, that claim 77 distinguishes applicant's invention patentably over the prior art of record and should be allowed.

The remaining claims depend, ultimately, on the respective independent claims with which they are associated and are allowable for the same reasons.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned **VERSION WITH MARKINGS TO SHOW CHANGES MADE.**

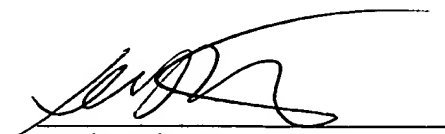
It is believed that this application now is in condition for allowance. Further and favorable action is requested.

The Patent Office is authorized to charge or refund any fee deficiency or excess to Deposit Account No. 06-0420.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

The paragraph beginning at line 2 of page 4 has been amended as follows:

A monobloc [monosteel] piston constructed according to a first embodiment of the invention is indicated generally at 10 in Figures 1-7 and comprises an upper crown part 12 fabricated of steel and a lower crown part 14. The lower crown part 14 is forged of one piece of steel and includes at least a portion 16 of a head 18 of the piston 10, a pair of pin bosses 20 extending downwardly from the head portion 16 to lower free ends 22 thereof, and a piston skirt 24 formed as one piece with the pin bosses of the same forged material. The skirt includes a pair of skirt portions 26 which are arranged on laterally opposite sides of the piston in spaced relation to the pin bosses 20, and intervening strut portions 20 extending between and interconnecting the skirt portions 26 and pin bosses 20.

The paragraph beginning at line 12 of page 13 has been amended as follows:

In addition to the upper slots 128, the skirt portions 326 may further be formed with one or more additional slots 132 intermediate the upper and lower ends of the skirt portions 310. One such slot 132 is illustrated in Figure 10 [9] as being in line with the pin bore axis B. The slots 128, 132 serve to lighten the piston 10 by eliminating material and further assist in decreasing oil consumption of an engine by presenting free edges 130, 134 which scrape oil from the walls of a piston cylinder during operation of the piston. The slots 128, 132 further serve to vent the piston skirt portions 126 and to uncouple them from the head of the piston in order to isolate the skirt portions 126 from the direct flow of heat from the head and to introduce cooling spaces into the skirt portions 126.

Claim 7 has been amended as shown:

7(Amended). The method of claim 1 wherein the recesses forged in the strut [web] portions are formed to extend above and below the pin bore axis.

Claim 60 has been amended as shown:

60(Amended). The piston of claim 59 [58] wherein said joint comprises a friction weld joint.

Claim 61 has been amended as shown:

61(Amended). The piston of claim 59 [58] wherein said inner surface of said inner walls extend vertically upwardly or at a positive outward draft angle from said inner faces to said joint.

Claim 62 has been amended as shown:

62(Amended). The piston of claim 59 [58] wherein said cavity extends into said upper crown above said joint in said undercut relation to said inner faces of said pin bosses.

Claim 71 has been amended as shown:

71(Amended). A monobloc [mono steel] piston comprising:

an upper crown portion fabricated of steel having a head portion formed with at least one circumferentially extending mating surfaces; and

a lower crown portion forged from a single piece of steel including an upper head portion having at least one circumferentially extending mating surface, a pair of pin boss portions extending downwardly from said upper head portion in laterally spaced relation to one another; and an integral skirt formed as a single forged piece with said pin boss portions including a pair of opposed skirt portions spaced from said pin boss portions and strut portions extending between and intermediate said skirt portions and said pin boss portions, said lower crown portion being multi-axially forged to include forged recesses in the piston skirt in one or more areas inaccessible by forging in the longitudinal direction of the piston; said mating surface of said lower crown portion being [friction] welded to said mating surface of said upper crown portion.

Cancel claim 76.

Rewrite claim 77 as follows:

77(Amended). A method of making a piston comprising:

fabricating an upper crown portion of steel having a head portion with at least one circumferentially continuous joining surface; and

multi-axially forging a lower crown portion from a single piece of steel including an upper head portion having at least one corresponding circumferentially continuous joining surface, a pair of pin boss portions extending downwardly from the upper head portion, and a piston skirt forged as one piece with the pin boss portions, and including a forged traverse recess in the lower crown portion inaccessible by forging in a longitudinal direction of the lower crown portion and [friction welding] connecting the joining surfaces of the upper and lower crown portions to unite the upper and lower crown portions.